mented upon. The contractions of the heart were more frequent after alcohol during complete rest, from five to ten beats per minute for some time; and when exercise was taken the increase was greater. The mean pulse of the twenty-four hours was, however, not increased unless the amount of alcohol was large and repeated. In other words, the heart's beats were less frequent than natural when the effect of the alcohol had passed off. The pulse became both fuller and softer to the touch; and this relaxation of the radial artery was shown also by the sphygmograph. That the smaller vessels were relaxed, was shown both by the redness of the surface and by the evident ease with which the blood traversed the capillaries, as shown by the sphygmographic tracings.

6. The respirations were not increased in number by alcohol; they were rather lessened, and were deeper in some of the experiments; but the effect was not very marked.

III. "Experimental Demonstrations of the Stoppage of Sound by partial Reflections in a non-homogeneous Atmosphere." By JOHN TYNDALL, D.C.L., LL.D., F.R.S., Professor of Natural Philosophy in the Royal Institution.

(See Paper read Jan. 15, *antè*.)

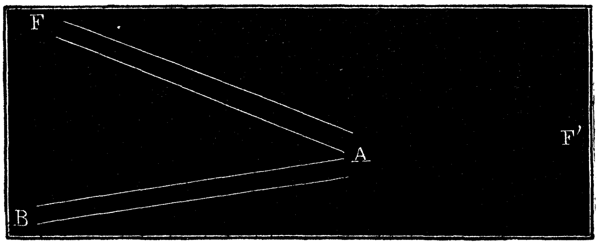
IV. "On the Division of a Sound-Wave by a Layer of Flame or heated Gas into a reflected and a transmitted Wave." By JOHN COTTRELL, Assistant in the Physical Laboratory of the Royal Institution. Communicated by Professor TYNDALL, F.R.S. Received February 2, 1874.

The incompetency of a sound-pulse to pass through non-homogeneous air having been experimentally demonstrated by Dr. Tyndall, and proved to be due to its successive partial reflections at the limiting surfaces of layers of air or vapour of different density, further experiments were conducted in order to render visible the action of the reflected sound-wave.

The most successful of the various methods contrived for this purpose consists of the following arrangement. A vibrating bell contained in a padded box was directed so as to send a sound-wave through a tin tube, B A (38 inches long, $1\frac{3}{4}$ inch diameter), in the direction B F', its action being rendered manifest by its causing a sensitive flame placed at F' to become violently agitated.

The invisible heated layer immediately above the luminous portion of an ignited coal-gas flame issuing from an ordinary bat's-wing burner

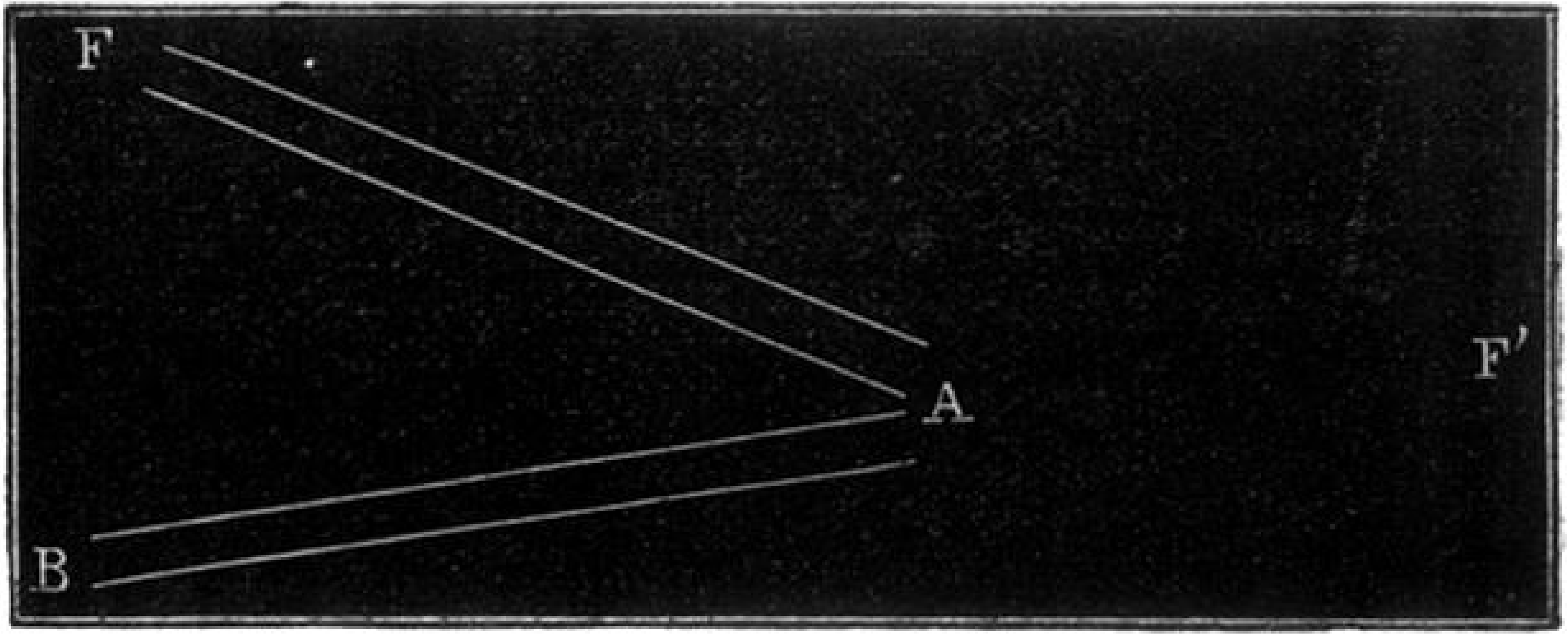
was allowed to stream upwards across the end of the tin tube B A at A. A portion of the sound-wave issuing from the tube was reflected at the limiting surfaces of the heated layer; and a part being transmitted through it, was now only competent to slightly agitate the sensitive flame at F'.



The heated layer was then placed at such an angle that the reflected portion of the sound-wave was sent through a second tin tube, A F (of the same dimensions as B A), its action being rendered visible by its causing a second sensitive flame placed at the end of the tube at F to become violently affected. This action continued so long as the heated layer intervened; but upon its withdrawal the sensitive flame placed at F', receiving the whole of the direct pulse, became again violently agitated, and at the same moment the sensitive flame at F, ceasing to be affected, resumed its former tranquillity.

Exactly the same action takes place when the luminous portion of a gas-flame is made the reflecting layer; but in the experiments above described, the invisible layer above the flame only was used. By proper adjustment of the pressure of the gas, the flame at F' can be rendered so moderately sensitive to the direct sound-wave, that the portion transmitted through the reflecting layer shall be incompetent to affect the flame. Then by the introduction and withdrawal of the bat's-wing flame the two sensitive flames can be rendered alternately quiescent and strongly agitated.

An illustration is here afforded of the perfect analogy between light and sound; for if a beam of light be projected from B to F', and a plate of glass be introduced at A, in the exact position of the reflecting layer of gas, the beam will be divided, and one portion will be reflected in the direction A F, and the other portion transmitted through the glass in the direction F', exactly as the sound-wave is divided into a reflected and transmitted portion by the layer of heated gas or flame.


F
A
F′
B